SIEMENS

# TECHNICAL MEMORANUM #1
# MAG ITS/TE On-Call Services
# Contract No. 321-I
# Glendale Stadium Area Congestion Map
# Proof of Concept Project

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**Version 2.0**

***Submitted To:***

**Maricopa Association of Governments**

***Submitted By:***

**Siemens**

## INTRODUCTION

Siemens has been contracted by the Maricopa Association of Governments (MAG) to explore the feasibility of generating a congestion map for the arterial street network surrounding the Glendale Stadium Area. The initial concept is of a congestion map to be developed based on occupancy feedback from detectors located at five signalized intersections on the east side of the Glendale Stadium area. Occupancy values would be extracted from the City of Glendale's i2 Traffic Management System. Algorithms would be developed to correlate occupancy values to congestion levels. Varying levels of congestion would be depicted by colored links on a map. The map would be available via the Internet. Congestion information could also be provided to drivers via color LED signs displaying link congestion ahead.

The first task of the project is to perform a field/hardware survey of the five signalized intersections. Results of the survey are documented in this Technical Memorandum.

## LOCATION SUMMARY

Five signalized intersections have been identified by the City of Glendale as candidates for inclusion in the initial congestion mapping deployment. These locations are:

1 Glendale Avenue & 91st Avenue

2 Coyotes Boulevard & 91st Avenue

3 Maryland Avenue & 91st Avenue

4 6250 & 91st Avenue

5 Bethany Home Road & 91st Avenue

Figure 1 provides an area map of the five project intersections.

Figures 2 – 6 provide detailed views of each of the individual intersection.


Figure 1 – Area Map


Figure 2 – Glendale Avenue & 91st Avenue


Figure 3 – Coyotes Boulevard & 91st Avenue


Figure 4 – Maryland Avenue & 91st Avenue


Figure 5 – 6250 & 91st Avenue


Figure 6 – Bethany Home Road & 91st Avenue

## CONTROLLERS, COMMUNICATIONS & DETECTION

The following table (Table 1) summarizes controller type, communications type and detection located at each of the intersections.

| Intersection | Controller Type | Communications Type | Detection |
|---|---|---|---|
| Glendale Ave & 91st Ave | Econolite ASC/2 | Serial* | Loops in left turns at stop bar for all four approaches** |
| Coyotes Blvd & 91st Ave | Econolite ASC/2 | Serial* | Loops at stop bar on side streets and all left turns** |
| Maryland Ave & 91st Ave | Econolite ASC/3 | Serial* | Solo Pro video detection on all approaches |
| 6250 & 91st Ave | Econolite ASC/3 | IP | Solo Pro video detection on all approaches |
| Bethany Home Rd & 91st Ave | Econolite ASC/3 | IP | Solo Pro video detection on all approaches |

* Future plans call for IP/Ethernet communication to this location.
** Plans call for video detection to be installed on all approaches at this location in 2008.

Table 1 – Summary of Controllers, Communications & Detection

## INTERSECTION LANE CONFIGURATION

The following table (Table 2) summarizes lane configuration at each of the subject intersections. For each intersection and each approach the number of left turn lanes (LT), through lanes (TH) and right turn lanes (RT) is denoted.

| | NB | | | SB | | | EB | | | WB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intersection | LT | TH | RT | LT | TH | RT | LT | TH | RT | LT | TH | RT |
| Glendale Ave & 91st Ave | 2 | 3 | | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 |
| Coyotes Blvd & 91st Ave | 2 | 3 | | | 3 | 1 | 2 | | 2 | | | |
| Maryland Ave & 91st Ave | 2 | 2 | | 1 | 2 | 2 | 2 | | 2 | 1 | | 1 |
| 6250 & 91st Ave | 2 | 2 | | 1 | 2 | | 1 | 1 | 1 | | 1 | |
| Bethany Home Rd & 91st Ave | 2 | 2 | | | 3 | 1 | 2 | | 2 | | | |

Table 2 – Summary of Intersection Lane Configuration

## INTERSECTION PHASING

Typical Glendale intersection phasing uses the following convection (Figure 7):

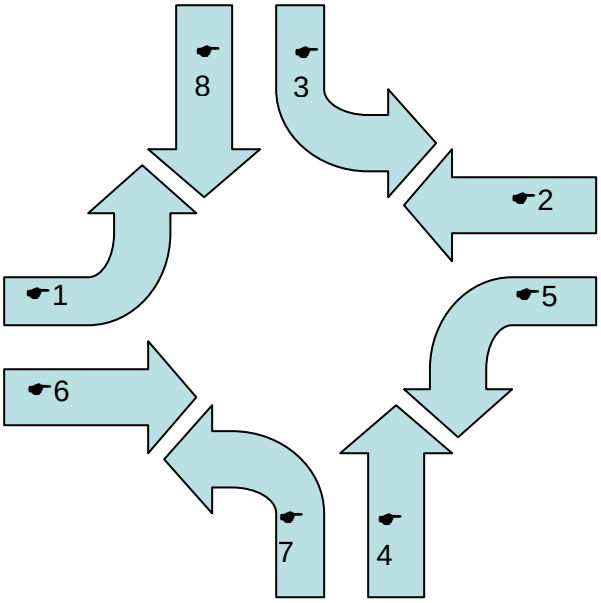


Figure 7 – Typical Glendale Phasing

Table 3 summarizes phasing information at each of the subject intersections.

| | Phase | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **Notes** |
| Glendale Ave & 91st Ave | EBL | WBT | SBL | NBT | WBL | EBT | NBL | SBT | Protected left turns on all approaches |
| Coyotes Blvd & 91st Ave | EBL | | | NBT | | EBR | NBL | SBT | NB left turn is protected |
| Maryland Ave & 91st Ave | EB | WB | SBL | NBT | | | NBL | SBT | Protected left turns on all approaches. SB right turn is overlap of P8 & P1. EB right turn is overlap of P7 & P1. |
| 6250 & 91st Ave | EBL | WBT | SBL | NBT | | EBT | NBL | SBT | NB left turn is protected. E/W is split phase. SB left turn is protected/permitted. |
| Bethany Home Rd & 91st Ave | EBL | PED | | NBT | | EBR | NBL | SBT | NB left turn is protected. P2 is exclusive pedestrian phase. |

Table 3 – Summary of Intersection Phasing

## DISCUSSION

Given the combination of controller types (ASC/2 and ASC/3), communications (serial and IP) and detection (Video on all approaches at each intersection), Glendale's existing infrastructure should support the necessary volume and/or occupancy retrieval necessary to provide link congestion measures. While the exact nature of the congestion algorithm will be explored in a subsequent technical memorandum (Technical Memorandum #2), the flexibility of the controllers to provide volume and occupancy data in a number of formats (fixed retrieval intervals for both ASC/2 & ASC/3, plus one second slices from a special version of the ASC/3 firmware) should provide a variety of techniques to extract congestion measures. While support for legacy controllers (ASC/2) is desirable, the focus of the project will be on ASC/3 controllers as that is the controller upgrade direction Glendale and many other agencies in the MAG region are pursuing.